

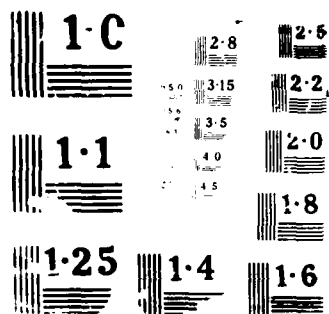
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MSS OF McCdTe

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FIRST INTERIM REPORT

CdTe/Telluride

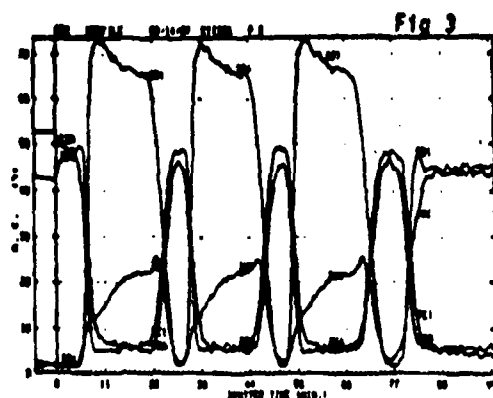
(Indium film on it)

During the present reporting period a feasibility study of InSb/CdTe superlattices and InSb/CdTe/InSb barrier systems for study of vertical transport properties has been conducted. Auger depth profiles of four-period InSb/CdTe (200/200Å) SL grown at 300, 200, and 75°C indicate severe interdiffusion and/or growth problems with this system (Figs 1, 2, and 3). CdTe can be successfully grown within the temperature range 180-300°C. InSb is typically grown between 300-400°C. Thus at present the overlap in the InSb and CdTe growth temperature windows is around 300°C. It is also apparent that there is very little incorporation of Cd. This is believed to be a consequence of the growth mechanism during the growth of an InSb/CdTe SL whereby the Te bonds with In resulting in Cd deficient layers. (See Table 1 (i)). Once the available In has bonded with the Te stoichiometric CdTe will then prevail. It is apparent that in order to obtain abrupt InSb/CdTe heterojunctions a full study of the parameters during growth will have to be examined. One possibility is the growth of the CdTe layers using Cd overpressures to force incorporation of Cd. Another is to place a monolayer of Te down following the growth of the InSb to bond with the available/active In and thus suppress disruption of the subsequent CdTe layer.

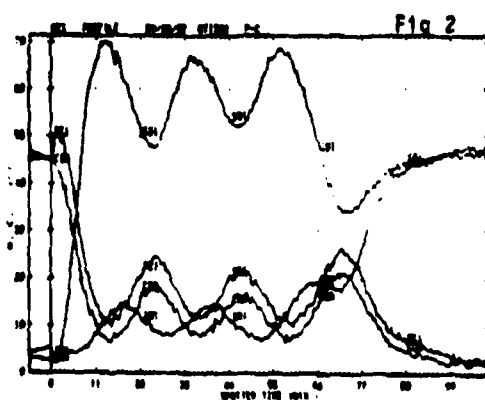
There is evidence to suggest that In₂Te₃ is one of the compounds formed at the InSb/CdTe interface (ii). In₂Te₃ is a zinc blend defect type semiconductor with a bandgap of around 1eV and lattice mismatch with InSb of about 5%. The Night Vision MBE has In and Te cells.

With this unique combination InTe_s has been grown at substrate temperatures compatible with InSb/CdTe SL (300°C). To our knowledge this is the first MBE InTe_s growth reported. It is now possible to examine the feasibility of InTe_s as a diffusion barrier placed between the InSb and CdTe layers. We are at present in the process of characterizing InSb/InTe_s/InSb structures for interdiffusion effects. Preliminary work seems very encouraging. This will take us to the possibilities of studying InSb/InTe_s systems for quantum tunneling and Stained Layer Superlattices.

- (i) B. Legendre, B. Gather, and R. Blachnik, Z. Metallkd. 71 588 (1980).
- (ii) K.J. Mackey, D.R.T. Zahn, P.M.G. Allen, R.R. Williams, and W. Richter, J. Vac. Sci. Technol. B5(4), 1233 (1987).



Ideal structure of InSb/CdTe system used for Auger profiles



Auger depth profiles of InSb/CdTe (200/200Å) SL grown at 300, 200 and 75°C. (Figs 1, 2, and 3 respectively)

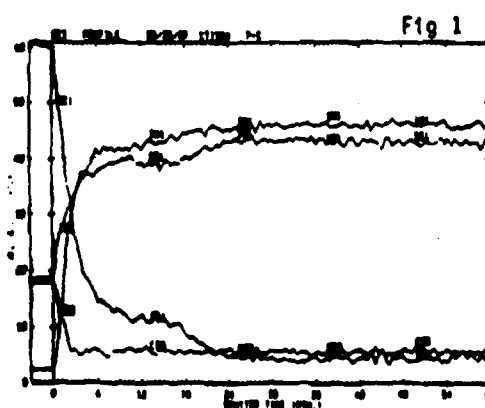


TABLE I Heats of formation

Compound	H (kcal/mol)
CdTe	-34.3
In ₂ Te	-19.0
InTe	-17.2
In ₂ Te ₃	-49.8
In ₂ Te ₂	-49.8
In ₂ Te	-7.9
Sb ₂ Te ₃	-13.9
Cd ₂ Sb	-3.2
Cd ₂ Sb ₂	-8.0

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